# Mechanic Testing Categories Overview

## Automobile & Light Truck

(Vehicles under 14,000 lbs. GVW)



## Heavy-Duty Truck (HDT)

(Vehicles 14,000 lbs. GVW and higher)



## Miscellaneous

# Engine Repair
## Automobile & Light Truck Repair

**Engine Fundamentals - 12%**
Micrometer reading
Bolt head markings
Engine R&R procedures
Engine break in

**General Engine Diagnosis - 28%**
Oil consumption
Cylinder leakage test
Compression test
Exhaust recognition
Engine sludge/contamination
Vacuum testing
Crankcase pressure/blow-by
Spark plug diagnosis
Engine noise
Power balance testing

**Engine Block Diagnosis and Repair - 22%**
Engine measurements and clearances
Piston installation
Cleaning and assembling procedures
Piston design
Piston ring diagnosis
Cam bearing installation

**Cylinder Head and Valve Train Diagnosis & Repair - 28%**
Valve deposits
Valve train measurements and clearances
Mechanical timing
Variable lift valves
Variable cam timing
Variable displacement
Valve guide wear
Valve spring diagnosis
Noise diagnosis
Camshaft diagnosis

**Lubrication and Cooling - 10%**
Cooling system diagnosis
Oil pressure diagnosis
Fluid identification

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# Automatic Transmission
# Automobile & Light Truck Repair

**Internal Operation – 26%**
Gear train end play
Band and servo operation
Planetary gear set
Multiple disc clutch packs
Shifting operation
Torque converter
Valve body
Transmission inputs
Electrical/Electronics

**General Diagnosis - 31%**
Shift quality
Fluid diagnosis
Band / clutch diagnosis
Fluid loss diagnosis
Pressure testing
Valve body diagnosis
Scan tool usage
External control
Transmission noise
Transmission performance

**Component Diagnosis - 12%**
Hydraulics
Torque converter
Clutch pack
Cooler operation
Solenoid operation and testing

**Repair Procedures 13%**
Transmission remove & replace
Transmission seals
Pump to converter engagement
Pump operation
Programming / calibration

**Fundamentals- 18%**
Fluids
Transaxle
Valve body components
General transmission operation
Start / stop operation
High-voltage safety
Valve identification Fluid types

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# Manual Transmission, Front & Rear Drive Axles
# Automobile & Light Truck Repair

**Transmission/Transaxle Diagnosis - 13%**
Fluid and transmission diagnosis
Hard shifting complaints
Transmission vs. transaxle comparison
Transaxle/Transmission gear recognition
Synchronizer problems & operation

**Clutch Diagnosis & Repair – 19%**
Clutch disc operation
Noise and chatter diagnosis
Shifting problem diagnosis
Hydraulic systems

**Component R & R - 10%**
Transmission remove and replace
Extension housing seal remove & replace
Synchronizer replacement
Electronic manuals

**Final Drive - 30%**
Ring gear run-out
Noise diagnosis
Differential diagnosis
Ring & pinion gear sets
Ring & pinion backlash
Pinion bearing pre load
Final drive ratio
Pinion seal remove & replace
Limited slip diagnosis
Differential bearing pre load
Lubricant types

**Axle Shaft\CV Repair - 9%**
CV boot installation
Drive axle diagnosis
CV joint operation

**4WD/AWD Systems – 9%**
Transfer case operation
4WD actuators
AWD operation

**Miscellaneous - 10%**
Bearing types
Gear type identification
Direct drive and gear reduction theory
Driveshaft angle

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# Front End, Suspension & Steering Systems
# Automobile & Light Truck Repair

**Alignment - 32%**
Alignment procedures
Vehicle pull diagnosis
Alignment diagnosis
Steering wheel center
Caster adjustment
Camber adjustment
“Toe” adjustment procedures

**Suspension - 29%**
Ball joint diagnosis
Measuring curb height
Ball joint remove and replace (R&R) procedure
Strut suspensions
Electronic suspension
Suspension symptom diagnosis
Component wear

**Steering - 20%**
Rack & pinion diagnosis
Electric power steering
Tie rod end diagnosis
Steering linkage diagnosis
Hydraulic power steering

**Fundamentals - 18%**
Lug nut torque
Wheel bearing adjustment
Basic alignment angle understanding
Tire wear

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# Brakes & Braking Systems
# Automobile & Light Truck Repair

**System Diagnosis and Repair - 26%**
Hydraulic valves
Brake pedal pulsation
Brake performance
Wheel bearings
Power assist systems
Fundamental procedures
Noise diagnosis

**Hydraulics Diagnosis and Repair - 23%**
Fluid diagnosis
Line repair
Hydraulic repair
Brake pedal feel
Brake bleeding
Leak diagnosis

**Electronic Brake System Diagnosis & Repair - 26%**
ABS pump / motor operation
Safety precautions
Speed sensors
Braking electrical diagnosis
Stability control systems

**Drum Brake Diagnosis & Repair - 12%**
Measuring and refinishing
Drum/Shoe types
Brake adjustment
Leak diagnosis
Parking brake
Brake hardware

**Disc Brake Diagnosis & Repair - 12%**
Measuring and refinishing
Caliper replacment
Parking brake
Brake hardware

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# Electrical Systems
# Automobile & Light Truck Repair

**Electrical Fundamentals - 25%**
High voltage safety
SIR (Supplemental Inflatable Restraint)
Basic electrical
Series circuit diagnosis
Relay operation
Circuit protection devices
Networking and communication

**Testing Equipment Usage - 16%**
Ohmmeter usage
Voltmeter usage
Ammeter usage
Voltage drop
High voltage systems

**Starting and Charging System Diagnosis - 19%**
Batteries
Starter diagnosis
Starter current draw
Starter circuit diagnosis
Generator / alternator diagnosis
Charging system output
Charging system circuit diagnosis
Voltage drop tests

**Circuit Diagnosis - 20%**
Short to ground
High resistance/open circuit
Blower motor circuit diagnosis
Lighting circuits
Cooling fan circuit
Warning circuits
Accessory circuits

**Electrical Diagrams - 20%**
Electrical circuit recognition
Diagram usage

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# Heating & Air Conditioning
# Automobile & Light Truck Repair

**Heating & Engine Cooling System Diagnosis - 21%**
Leak diagnosis
Freeze protection
Low heater output
Pressurized systems
Defrost operation
Overheating

**General Knowledge of A/C Components & Their Functions - 19%**
Receiver drier / accumulator
Temperature sensors
Refrigerant oil
Compressor clutch
Condenser
Evaporator
Orifice tube
Thermostatic expansion valve

**General Knowledge of A/C Systems - 12%**
Refrigerant types
Refrigerant states
Operating pressures

**A/C Diagnosis - 26%**
Condensation
Leak detection
Overcharged/undercharged system
Compressor clutch
Gauge set readings
Lack of cold air
Electrical schematic interpretation
Air delivery

**A/C Repair Procedures - 18%**
Recovering refrigerant
Seal replacement
Compressor replacement
Charging the system
Component replacement

**Refrigerant Recovery, Recycling & Handling - 4%**
Refrigerant environmental concerns
Recycling or recovering refrigerant

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# Engine Tune-up/Performance
# Automobile & Light Truck Repair

**Electronic Controls - 29%**
Programming / memory
Fault codes
Closed loop
Sensor diagnosis
Oxygen sensor operation
Position sensor reading
Multimeter usage
Scan tool usage

**Ignition Systems - 13%**
Timing recognition
No spark diagnosis
Causes of detonation
Spark plug diagnosis

**Fuel System - 24%**
Injector pulse width
Fuel line replacement
Fuel injection principals
Causes of a rich mixture
Causes of a lean mixture
Fuel quality/content
Turbocharger

**Diagnosis - 18%**
Engine mechanical timing
Circuit resistance checks
Engine vacuum
Catalytic converter
Cylinder leakage
Compression test

**Emission Control Systems – 16%**
EGR operation
Evaporative emission control system
Catalytic converter
General emissions

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# Unitized Body Structural Repair
# Automobile & Light Truck Repair

**Materials**
**(Characteristics & Identification) - 17%**
Aluminum
UHSS (Ultra High Strength Steel)
HSS (High Strength Steel)
Plastics

**Material Joining – 23%**
Flow drill screws
Self piercing rivets
Adhesives
Characteristics of:
- MIG/GMAW
- STRSW/Spot welding
- TIG/GTAW
- Oxy/Acetylene

Welding precautions
Shielding gas

**Repairing Structural Components - 21%**
Structural component identification
Sectioning
Types of welds:
- Fillet
- Plug
- Butt with backing
- Open Butt

Anchoring
Corrosion protection

**Glass Replacement and Installation – 5%**
Types of glass

**Measuring/Damage Analysis - 25%**
Point to point
Direct damage
Indirect damage
Primary damage
Secondary damage
Types of damage:
- Mash
- Sway
- Sag
- Twist
- Diamond

Datum plane
Vehicle centerline
Asymmetrical dimensions

**Unitized Body General Understanding - 10%**
Crush zones
Design features which initiate the crush process
Manufacturers' tolerances
One-time fasteners

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**Steering and Suspension - 13%**
Component identification
Alignment adjustments
Steering column diagnosis
Rack & pinion
Power steering

**Heating & Cooling - 10%**
General questions

**Electrical - 33%**
Wire repair
Symbol identification
Circuit diagnosis
ADAS system
Sensor diagnosis / repair
Module replacement
High voltage safety
Airbag safety

**Restraint Systems – 11%**
Airbag inspection
Airbag damage
Airbag replacement
Pretensioner

**Drive Train - 15%**
Vibration diagnosis
Noise diagnosis
Transaxle
Bent parts

**Brakes - 11%**
Brake bleeding
Brake line
ABS

**Miscellaneous - 7%**
Tire identification
Wheel diagnosis

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# Motorcycle Repair
# Automobile & Light Truck Repair

**Fuel Systems - 21%**
Lean / rich mixture identification
Causes of a lean mixture
Causes of a rich mixture
Exhaust color diagnosis
Backfire diagnosis
Carburetor components and operation
Fuel Injection components and operation
Spark plug fouling and diagnosis
Fuel pressure
Oxygen sensor operation

**Measuring and Tools - 11%**
Using Plastigage
Using a dial indicator
Using a Volt-Ohm meter
Using a bore gauge
Using a feeler gauge
Using a micrometer
Shaft run out
Understanding decimal equivalents up to 1/1000”
Piston ring end-gap
Understanding metric system measurements
Compression / leak down testing

**Ignition and Electrical - 20%**
Types of position sensors and their function
Function of a relay / solenoid
Function of a stator / rotor
Function of a regulator / rectifier
Ignition coil diagnosis
Splicing electrical connections
Continuity testing
Voltage drop
Parasitic draw
Diagnosing turn signal circuits
Alternator output problems

**Drive Train - 9%**
Clutch operation and diagnosis
Transmission shifting problems
Drive chain diagnosis/repair/maintenance
Drive Belt diagnosis / maintenance
Shaft Drive diagnosis / maintenance

**Brakes – 9%**
Hydraulic brake system operation / maintenance
Brake pad wear diagnosis
Brake rotor diagnosis/repair
ABS system
Brake system bleeding

**Suspension and Chassis - 10%**
Hydraulic fork diagnosis / repair
Wheel bearing diagnosis / repair
Tire replacement
Stem / neck bearing diagnosis / repair

**Engine Repair / Performance - 20%**
Understanding the 4-stroke/cycle engine
Camshaft operation
Valve lash diagnosis / adjustment
Low oil pressure diagnosis/repair
Worn valve guide diagnosis
Cylinder bore diagnosis / measurement
Cylinder deglazing
Proper cylinder finish
Head bolt torque sequence
Piston ring identification
Bearing / race installation
Piston slap
Oil pressure relief valve operation

# Recreational Trailer
# Automobile & Light Truck Repair

**Electrical Diagnosis - 36%**
Trailer tail lamps
Ground wire problems
Turn signal circuits
Determine voltage drop
Trailer stop lamps
Brake controllers
4-Wire connectors
Current supply for trailer brakes
Electrical symbols
Flasher diagnosis
Color codes
Causes of blown fuses
Current flow / resistance

**Brake Diagnosis - 26%**
Loss of brakes
Grabby brakes
Dragging brakes
Erratic braking, surging
Pull to one side during braking
Adjusting trailer brakes
Brake shoe recognition

**Springs/Hitches - 16%**
Leaf springs
Equalizing hitches
Adjustment of hitches
Types of trailer springs
Spring maintenance

**General Knowledge - 12%**
Surge brakes
Reducing sway
Wheel bearing adjustment
Hydraulic brake lines
Metric measurements
Tire wear diagnosis

**Wheels/Hubs - 10%**
Wheel bearing diagnosis
Wheel bolt torque pattern

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**Ohms Law & Electrical Symbol Recognition - 13%**
Ohms Law
Splice symbol
Diode symbol
Relay symbol

**Starting System Diagnosis – 13%**
Starter current draw
Starter relay diagnosis
Circuit resistance Test
Battery test

**Miscellaneous Circuit Diagnosis – 6%**
Regulator diagnosis
Horn circuit diagnosis

**General – 13%**
Electrostatic discharge
Voltage drop test
Circuit protection

**Test Meter Usage – 6%**
Ohmmeter usage
Voltmeter usage

**Installation/Legal questions**

**Legal Requirements – 25%**
Installer requirements
Service area requirements
Customer requirements
Customer training

**General – 24%**
Violation reset
Tampering
Emergency bypass code
Removal of device
Set point

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# Engine Repair - Gasoline
# Heavy Duty Truck Repair

**Engine Mechanical Diagnosis - 26%**
Spark plug evaluation
Engine noise
Compression test
Oil consumption
Exhaust smoke color
Cylinder blocks
Cylinder heads
Piston rings
Overheating

**Skills In Measuring - 12%**
Torque angle
Measuring cylinder bore
Reading a micrometer
Reading a dial indicator
Reading Plastigage
How to check crankshaft end play

**Fundamentals – 31%**
Electrical terms and definitions
Series / Parallel circuits
Understanding how engines operate
Cooling system operation
Ignition systems
Camshaft timing
Fuel systems

**Electronic Controls – 32%**
EGR operation
Variable valve timing
Sensor operation / diagnosis
Scan tool operation
EVAP system

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# Engine Repair – Diesel
# Heavy Duty Truck Repair

**Engine Components - 22%**
Piston rings
General piston knowledge
Aftercooler operation
Oil temperature
Oil distribution
Turbo charger operation
Valve bridge function

**Engine Mechanical Diagnosis - 20%**
Turbocharger diagnosis
Coolant in crankcase
Exhaust smoke diagnosis
Engine operating temperature
Oil pressure diagnosis
Engine tear down diagnosis
Blow by
Connecting rod diagnosis
Engine misfire

**Fuel Systems - 12%**
Types of injection
Leaky fuel lines
Fuel system diagnosis
Fuel Filter diagnosis

**Skills In Measuring - 10%**
Measuring tools
Reading Plastigage
Reading a micrometer
Crankshaft end play

**Fundamentals - 14%**
Using a digital multi meter
Bolt grades
Understanding 4-stroke engines
Valve lash adjustment

**Electronic Controls and After-Treatment – 22%**
EGR operation
DEF function / maintenance
DPF function / maintenance
DOC

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# Drive Train
# Heavy Duty Truck Repair

**Clutch Components & Diagnosis - 19%**
Causes of hard shifting
Clutch pedal free play
Slipping clutch
Clutch “chatter”
Clutch brake
Pilot bearing
Clutch adjustment

**Driveshaft Components & Diagnosis - 17%**
Driveline angles
Driveshaft disassembly
Driveline vibration
U-Joint replacement
U-joint maintenance

**Axle Components & Diagnosis - 18%**
Ring and pinion backlash
Inter-axle differential lock
Pinion bearing pre load
Differential side bearing pre load

**Transmission Components & Diagnosis - 46%**
Torque converter operation
Planetary gears
Causes of hard shifting
Automated mechanical transmission
Scan tool operation
Overdrive / underdrive
Transmission fluid condition
Clutch disc springs
Transmission / clutch noise

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# Brakes & Braking Systems
# Heavy Duty Truck Repair

**Basic Knowledge - 25%**
Anti-lock brakes (ABS)
Stability control system
Types of Brake line flares
Hydro-boost systems
Hydraulic brake line material
Air brake hand valve
Drum brake leak diagnosis
Master cylinder operation
Preset wheel bearing
Grease-soaked brake linings

**Air Brake Diagnosis & Repair - 58%**
Air brake systems operation
Finding air leaks
Air pressure diagnosis
Air compressor operation
Tractor protection valves
Dual diaphragm brake chamber operation
Pushrod travel

Spring brake repairs
Air pressures for fail-safe brakes
Adjusting cam actuated brakes
Brake linkage lubrication
Air line material
Slack adjuster and pushrod angle
“S” cam brake operation
Air dryer operation
Trailer brakes won’t release

**Hydraulic Brake Diagnosis & Repair - 17%**
Hydro-boost systems
Swollen master cylinder diaphragm
Cause of gear lube inside brake drums
Grabbing brakes
Causes of a pulsating pedal
Brake lining wear diagnosis

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# Suspension & Steering Systems
# Heavy Duty Truck Repair

**Steering System Diagnosis - 19%**
Power steering analyzer tool
Power steering unit noise
Power steering leak
System bleeding
Aerated power steering fluid
Free play in steering
Wheel shimmy
Tie rod end play

**Suspension Diagnosis - 19%**
Air ride suspension operation
Leaf springs
Hendrickson suspensions
Torque rods
Tandem axle alignment
Tracking rods

**Wheel Alignment - 19%**
Toe-in adjustment
Tire inflation
Tire wear analysis
Camber / Caster / Toe
Effects of different angles on vehicle operation

**Basic Steering System Knowledge - 19%**
Front suspension components
Steering gear operation / diagnosis
Wheel bearings
Steering wheel free play
Steering knuckle wear
Power steering pump replacement

**Basic Suspension Knowledge - 19%**
Castle nut tightening
Lug nut tightening sequence
Walking beam suspension
Suspension adjustment
Equalizing beam suspensions
Adjustable trailer axles

**Fifth Wheel Knowledge – 6%**
Fifth wheel adjustment
Fifth wheel diagnosis
Hardware grade

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# Electrical Systems
# Heavy Duty Truck Repair

**System Diagnosis - 28%**
Parallel vs. series
Trailer light diagnosis
Relay testing / diagnosis
Ground faults
Windshield wiper circuit
Circuit diagnosis

**General - 11%**
Batteries
Data bus
Welding
Module replacement

**Vehicle Lighting – 11%**
Turn signal circuit
Tail lamp circuit
Head lamp circuit
Trailer wiring
Clearance lights

**Starting & Charging System Diagnosis - 36%**
Battery charging
Battery load test
Alternator output
Charging system voltage
Circuit resistance
Voltage drop test
Starter diagnosis
Starter draw test
Starter terminal identification

**Test Methods & Equipment - 14%**
Voltmeter use
Ohmmeter use
Circuit testing
Diode operation
High voltage fuel system
Voltage drop test

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It is suggested that you prepare by reviewing the Mechanic Study Guides. These study guides provide a list of the categories and subcategories that will be on each test. Each category is given a percentage indicating how many of the test questions will be drawn from that category. This allows you to plan your study time and concentrate on those areas that are given the most emphasis on the test.